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INITIATION OF LONG-TERM, STAND-LEVEL
MONITORING OF VEGETATION IN AQUARIUS
NATURAL AREA. CLEARWATER NAT. FOREST

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**INITIATION OF LONG-TERM, STAND-LEVEL MONITORING
OF VEGETATION IN AQUARIUS RESEARCH NATURAL AREA,
CLEARWATER NATIONAL FOREST**

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Abstract

Landscape-level vegetation monitoring presents many challenges. However, the most rapid changes in vegetation often occur at this scale. In this project, baseline data were collected from plant communities in Aquarius Research Natural Area (RNA), to provide a basis for vegetation monitoring at a landscape scale. In order to sample and describe the range of plant communities making up the RNA, a gradient-transect approach was implemented, which attempts to maximize the environmental gradient sampled. The Forest Service's Timber stand management record system (TSMRS) was used to determine the different combinations of landform, parent material, and aspect present in the RNA and to estimate the number of acres within each combination (bioenvironment). Each bioenvironment was then sampled relative to its representation in the study area. Tenth-acre plots were used to sample canopy cover by species within three canopy layers, and a variable-plot method was used to estimate tree density. In addition, permanent plots were established within a recent burn and a windthrow area, representing important disturbance types in the RNA. Obtaining a representative sample of the bioenvironments as defined *a priori* proved difficult and used resources that may have been better spent on more thorough stand descriptions. However, the design resulted in a thorough inventory of habitat types in the RNA, their relationship to bioenvironments, and their present condition. Data were used to classify stands as to seral status and structural condition. Six stands were selected that represent the range in seral stages and structural conditions present, and can serve as locations for more detailed monitoring. Plot locations, mapped at 1:24,000, can serve as training areas for interpreting aerial photos of the RNA and tracking changes in the pattern of plant communities.

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Introduction

Long-term ecological monitoring of plant communities is identified as a priority in the *Implementation Plan for Management and Monitoring* for Aquarius RNA (Lichthardt 1995). The purpose of long-term ecological monitoring, or baseline monitoring, is to document the rates and types of changes that occur in response to natural processes such as succession and disturbance (Elzinga and Evenden 1994). Two recent, extensive disturbances in Aquarius Research Natural Area (RNA) illustrate the need for broad-scale baseline data and a method of documenting changes in landscape patterns over time.

Justification for establishment of Aquarius RNA was primarily related to the occurrence of rare and disjunct plant species and rare plant associations. Permanent monitoring plots have been established in eleven examples of plant associations of interest including western redcedar/maidenhair fern (*Thuja plicata*/*Adiantum pedatum*), western redcedar/woodfern (*Thuja plicata*/*Dryopteris* spp.), and red alder/maidenhair fern (*Alnus rubra*/*Adiantum pedatum*); as well as in five populations of rare plants (Lichthardt 1992). Monitoring plots are all located in forest communities in late-seral or climax stages of development.

The scope of current monitoring is not indicative of the diversity of plant communities present in the RNA, or even of the major forest communities. Knowledge of structural condition and seral status of forest communities is important for understanding and documenting the contribution of a site to conservation. Stand structure and seral status also determine ecosystem processes such as: provision of habitat for plant and animal species, fire behavior, disease behavior, and the interactions between these factors.

In this project, I sought to sample and describe the structure and seral status of plant communities present within major habitat types represented in the RNA. The resultant data can be used to more accurately define the plant communities associated with stand polygons that have been delineated in the RNA. This map of plant communities can then be used, in conjunction with aerial photography, to monitor broad-scale changes over time.

Objectives

Objectives of this project were:

- To quantitatively describe the range of plant communities occurring along major environmental gradients within the RNA.
- To document the structure and species composition of specific stands that can be used as training points for interpreting aerial photos of the RNA, with the ultimate objective of tracking changes in vegetation patterns in the RNA over time.
- To establish permanent plots in recent disturbance patches that can be used to detect site-specific changes in vegetation following disturbance.

Study Area

The 3900-acre (1578-ha) RNA lies almost entirely within breaklands of the North Fork Clearwater River. Slopes rise steeply from the river on either side of the westerly flowing river section. Slopes are extremely steep except for areas of undulating, mass-wasted slopes resulting from the inherent instability of the schist parent material.

Within the RNA is preserved a portion of the core area of coastal refugium in the Northern Rockies (Lichthardt and Moseley 1994). River elevations of 1500 ft (460 m), are entrenched within the mountainous western edge of the Clearwater Mountains creating uniquely wet, mild conditions which are reflected in the occurrence of unique community types and large degree of floristic affinity with Pacific coastal forests.

Most of the RNA is densely forested. Habitat types are predominantly those of the western redcedar series. However, the existing forest cover is a mosaic of stand ages and species composition reflecting primarily aspect (north vs. south-facing canyonsides) and past fire history (Barrett 1993). Stand-replacing wildfires affected extensive areas of the RNA in 1910 and 1931, but many stands date from earlier fires (1836 to 1868; Table 6). Fires on the moist slopes south of the river, and lower slopes on the north side, tended to underburn as indicated by fire scars on large individuals of western redcedar. Where stand-replacing fires occurred, charred cedar shells usually provide evidence of the climax vegetation type. Douglas-fir is the dominant seral species after fire, although grand fir is frequently co-dominant. White pine blister rust reached the area in the early 1900s, and the die-off of white pine opened the canopy of some stands, significantly affecting their structure.

There are inclusions of steep rock outcrop on the north side of the river on which shrubland is probably the potential natural vegetation. In the spring, moist rock faces on both sides of the river are moss-covered and support a diversity of wet-site forbs not found in the forest understory.

Appendix A, Map 1 shows the delineation of landtypes in the RNA as taken from 1:24,000 maps obtained from the Clearwater National Forest Supervisor's office. Landtypes are fully described in Wilson *et al.* (1983). Much of the RNA consists of landtype 50—mass-wasted slopes. This landtype is typical of schist parent material. The remainder is mostly in landtypes 60S and 61S, steeply sloping stream breaklands in mica schist. Stream breaklands also include granitic (60G) and undifferentiated (61U) parent materials. A minor portion of the area at upper elevations is classified as moderate relief uplands and mountain slopelands (landtypes 24S and 31S). In contrast to stream breaklands, these have slopes generally less than 60% and do not adjoin actively downcutting streams. The parent material is mica schist.

This study did not target river terraces (landtype 10A) which were sampled by Lichthardt (1991) and Lichthardt and Moseley (1994), or riparian stringers. These landforms are not sufficiently delineated at the scale used in this project.

Thorough descriptions of the environment and vegetation of Aquarius RNA can be found in Moseley and Wellner (1988). A description of the Clearwater refugium environment and its biodiversity values can be found in Lichthardt and Moseley (1994).

Methods

To describe the range of seral and structural conditions represented in the RNA, an objective sampling design was imposed similar to the gradient transect method described by Austin and Heyligers (1989) and used in a larger study of the Clearwater refugium (Lichthardt and Moseley 1994). This method is designed to capture the environmental variation present in the study area and therefore maximize the biological diversity sampled. It requires stratification of the study area, based on significant environmental variables which have been previously delineated. The RNA was stratified for sampling based on elevation, as an indicator of temperature; aspect, as an indicator of moisture regime; and landtype, as an indicator of landform and parent material. Canyonside (north vs. south) was further used as a proxy for aspect.

Elevation zones (2,000-2,400 ft and 2,400-4,000 ft) were designed to partition the unsampled area of the RNA approximately in half, and to spread samples across the elevational gradient present. Elevations of 1,600 to 2,000 ft are represented in earlier sampling (Lichthardt 1991; Lichthardt and Moseley 1994). Since the North Fork Clearwater River through Aquarius trends east-west and the slopes on either side are very steep, aspects on the north side are generally warm and those on the south, cool. Therefore for convenience, the area was stratified into south and north canyonsides, ignoring inclusions of cool aspects on the north side and visa versa. Nine described landtypes (Wilson *et al.* 1983) are mapped in the RNA (Table 1). Landtypes are a combination of landform and parent material.

Table 1. Landtypes mapped in Aquarius RNA (Wilson *et al.* 1983).

Map code	Landform	Parent material
10A	Flood plains, terraces	Alluvium
15U	Colluvial toeslopes and fans	Undifferentiated
24S	Moderate relief uplands	Mica schist
31S	Mountain slopelands	Mica schist
50	Mass-wasted slopes	Various
60G	Non-dissected stream breaklands	Granitics
60S	Non-dissected stream breaklands	Mica schist
61S	Dissected stream breaklands	Mica schist
61U	Dissected stream breaklands	Undifferentiated

A map of bioenvironments (canyonside x elevation zone x landtype combinations) was created by overlaying the landtype map onto a 7.5' topo quad with the 2,000-ft and 2,400-ft contour intervals, and RNA boundaries delineated (Appendix A, Map 1). Acreage within each bioenvironment was determined by overlaying this map on 8 squares/inch graph paper and counting the number of points (meeting points of grid squares) within each polygon.

The number of acres per grid point was determined by dividing the total acreage of the RNA (3390 acres) by the total number of grid points. Using this method, I arrived at a conversion factor of 0.745 acres/grid point. Acreage by bioenvironment is shown in Table 2.

The RNA has been delineated into stand polygons, which reflect vegetative cover types as identified from aerial photographs. Stands are numbered in a hierarchical system, by compartment, subcompartment, and stand. Appendix A, Map 3 shows numbered stands with subcompartment numbers circled. The area north of the river is in compartment 302 and most of the area to the south, compartment 303. South of the river, the easternmost portion of the RNA, in range 7-east, is in compartment 313.

Stand polygons formed the basis of sampling. For example, to represent a bioenvironment cell that was landtype 50, north side of the river, between 2,000 and 2,400 ft, I looked for the most easily accessible stands representing that landtype, that overlapped that elevation zone. My goal was to place only one plot in a stand, in this way spreading the samples across different seral and structural types in each bioenvironment.

Table 2. Acreage by bioenvironment (canyonside x elevation zone x landtype).

Canyonside	Elev. zone ft	Landtype	Acres	Acres as % of total %
North side (Warm aspects)	1600-2000	15U	35	1.0
		31S	21	0.6
		50	80	2.4
		61U	63	1.8
	2000-2400	31S	20	0.6
		50	160	4.7
		61U	50	1.5
	> 2400	31S	97	2.9
		50	168	5.0
		60S	115	3.4
		61S	283	8.3
		61U	33	1.0
	1600-2000	10A	18	0.5
		31S	46	1.4
		50	404	11.9
		60G	47	1.4
South side (Cool aspects)	2000-2400	31S	62	1.8
		50	510	15.0
		60G	39	1.2
		60S	36	1.1
		61S	15	0.4
	> 2400	Rock	16	0.5
		24S	44	1.3
		31S	43	1.3
		50	542	16.0
		60G	15	0.4
		60S	389	11.5
		61S	39	1.1
	Totals		3390	100

A single, tenth-acre plot was subjectively placed to represent the character of a stand. The plot was a circle of 37-ft radius. The plot was placed in a relatively homogeneous area when possible, or within one cover type that was part of a mosaic making up the stand. Structure and composition of the overstory were the primary criteria.

Ecodata methods (Bourgeron *et al.* 1991) were used to record vegetation and site data. Because Ecodata plots have been used in and near the RNA in previous years, I began numbering plots with the next, consecutive 3-digit number not used in previous plots: 063. This will avoid confusion in the event that all plots in the RNA are summarized, and eliminates the need to prefix the plot number with the year and recorder's initials, as is the system with Ecodata key i.d. numbers.

Canopy cover was recorded by species and by life form within three strata: under 2.5 ft, 2.5 to 6.5 ft, and over 6.5 ft. Tree cover was recorded by diameter class and by species within diameter class. From plot center, a relascope, with basal area factor 20, was used to determine which trees fell within a variable plot, then each tree counted "in" was measured for dbh to give an estimate of trees/acre using the following formula:

$$\text{Trees per acre} = \sum \frac{\text{BAF (183.35)}}{d^2}$$

where BAF = 20, and d = diameter at breast height in inches.

Saplings are too small to be counted with this method, so a simple count of saplings was made within the 0.1-acre plot.

Whenever possible, one or more trees from the dominant size class was bored as an indication of the age of the stand. Western redcedar were generally avoided because of their hollow centers. Height was measured on an individual in the canopy layer with the greatest foliar volume to indicate dominant layer height.

At least one photo was taken of each plot. A complete set of slide transparencies and Ecodata field forms are on file at: the Natural Areas Program, USDA Forest Service, Rocky Mountain Research Station, Missoula, Montana; and at the Idaho Department of Fish and Game, Conservation Data Center (CDC) in Boise.

Permanent plots were established at two places to monitor disturbance patches: #64 is within the 1994 Sam burn, and #86 is in an opening created by a major blowdown event, also in 1994. Permanent plots are marked at the center with steel fence posts, and the tops are inscribed with the plot number.

The Sam fire started on August 3rd of 1994 and was primarily a surface fire which crowned out in several places creating openings of 3 acres or less. Many small-diameter understory trees, primarily grand fir and western redcedar, were killed. The plot is accessed from the 6042 road east of Swan Point. At the end of the road, a broad ridge runs from the road into section 36 and there is only a narrow strip of unburned forest between the road and the burn. The plot is just off the eastern side of this ridge, between the ridge and some very steep slopes.

The blowdown area northeast of Thompson Point is a 30-acre swath in which most of the trees, primarily Douglas-fir, red alder, and western larch, were broken off in a single wind

event in May of 1994. Only scattered, mostly small-diameter, trees remain standing. The blowdown is delineated as stand number 303-3-50 in Appendix A, Map 3. Plot 86 is located near the top of the swath, close to its eastern edge. The very top of the blowdown narrows abruptly and has a gentle slope. The plot is just below a break in the slope where it becomes slightly steeper, on an aspect of 70°. A small stream runs along the eastern edge of the plot. There are six recent tip-up mounds in the plot, and also a large, natural debris pile in the west half. The plot is marked at the center with a steel center post painted yellow.

Results

Access to the RNA south of the river is extremely difficult, and the sampling design did not mitigate travel problems as much as was hoped, primarily because extensive areas of landtype 50 are located south of the river, in the most remote area of the RNA.

Thirty-three plots were ultimately sampled, representing thirty-one stands. The extent to which a stand is described by a single plot is dependent on its variability. Some stands are very uniform, while others are complexes of several different communities not separable at the 1:24,000 scale. Such highly variable stands are noted in the comments section (Appendix B, Table 6). In these cases the plot characterizes one of the communities contained within the stand.

Table 3 shows the 28 different bioenvironments (canyonside x elevation zone x landtype combinations) occurring in the elevation zones targeted for sampling, and compares their representation in the sample with that in the study area. Three plots on the north side of the river actually had cool/moist aspects of 310-320 degrees, and three on the south side had aspects of 260-290 degrees. However, these aspects were considered to represent microsites, with the overriding consideration being the general aspect of the landform and the south-horizon angle, which is much steeper for plots on the south side of the river. For example, moist microsites on the north canyonside would be subjected to the higher fire frequency on this side of the canyon, unless they occurred along streams.

The sampling design succeeded in that samples were fairly well distributed across the range of bioenvironments present. The major exceptions are landtypes 60S and 61S which did not get sampled south of the river below 2400 ft (a bioenvironment representing less than 1.5% of the RNA). However, landtype 60S was also undersampled above 2400 ft.

In general, bioenvironments were undersampled, as a result of several limited cells being oversampled (e.g. south-24S, north-31S, and north-61U). Landtype 50, which encompasses the largest portion of the RNA, was undersampled on cool aspects below 2400 ft and oversampled above 2400 ft. However, since the precise boundary between elevation zones does not have any biological significance, the pertinent outcome is that stands were sampled across the elevational range of the RNA. Landtype 24S was oversampled, but one of the plots was the permanent plot within the Sam burn. All of landtype 60G occurs in an area of steep cliffs across the river from Isabella Creek, and no attempt was made to sample in this area which represents a small cell and is also very heterogeneous.

Table 4 shows the bioenvironments represented by previously established plots. Their representation in the RNA was not calculated because the landforms involved are mostly too small to be delineated at 1:24,000.

Table 3. Representativeness of the set of stands sampled with reference to bioenvironments in the targeted elevation zone of 2,000 to 4,000 ft, and plot numbers representing each.

Canyon-side	Elev. zone	Landtype	Number of stands sampled	Acres as % of total ¹	No. of stands sampled as % of total	Plots	
	ft			%	%		
North	2000-2400	31S	2	0.7	6	77, 80	
		50	2	6.0	6	69, 73	
		61U	2	1.9	6	78, 84	
	> 2400	31S	3	3.6	9	71, 72, 79	
		50	1	6.3	3	70	
		60S	1	4.3	3	76	
		61S	2	10.6	6	74, 75	
		61U	0	1.2	-	-	
	South	2000-2400	31S	0	2.3	-	-
			50	4	19.1	12	63, 83, 94, 95
60G			0	1.5	-	-	
60S			0	1.3	-	-	
61S			0	0.6	-	-	
> 2400		Rock	0	0.6	-	-	
		24S	3	1.6	9	64, 65, 66	
		31S	0	1.6	-	-	
		50	10	20.2	30	81, 82, 85-87, 89-93	
		60G	0	0.6	-	-	
		60S	2	14.5	6	67, 68	
		61S	1	1.5	3	88	

¹ Total acres = 2676; numbers of acres by bioenvironment are shown in Table 2.

Table 4. Bioenvironments represented by permanent plots established in 1991.

Canyon-side	Elev. zone ft	Landtype	Plots
North	1600-2000	10A 15U 31S	4, 5, 8, 9 6, 11 10
South	1600-2000	10A 50	1, 2, 3 7

Data were entered, and saved as text-only (ASCII) files for import into a database or spreadsheet. Five different files were used for different categories of data to simplify viewing. Data files are organized in the same manner as the tables in Appendix B. Separate files were created for data on plot location (Appendix B, Table 1); habitat type and vegetation layers (Appendix B, Table 2); tree density, height, diameter, and age (Appendix B, Table 3); site variables and cover by lifeform and size class (Appendix B, Table 4); and tree cover by species and size class (Appendix B, Table 5). All data files are linked by the seven-digit plot identification numbers.

Copies of the datafiles on disc and of the field data sheets are on file at the USDA, Forest Service, Rocky Mountain Research Station, Missoula, Montana, and at the CDC. Comments from the field data sheets are recorded in Appendix B, Table 6.

Understory cover by species was not entered, as it was not essential to the objectives of this study. Herbaceous cover data are pertinent to determining habitat type, which can be somewhat subjective. This information may also be important to other applications of the data.

Habitat types. Forest habitat types encountered were, from dry to moist: grand-fir/wild ginger (*Abies grandis*/*Asarum caudatum*), western redcedar/queencup beadlily (*Thuja plicata*/*Clintonia uniflora*), western redcedar/wild ginger (*T. plicata*/*A. caudatum*), western redcedar/maidenhair fern (*T. plicata*/*Adiantum pedatum*), and red alder/maidenhair fern (*Alnus rubra*/*A. pedatum*; Steele 1971). All habitat types other than *Alnus rubra*/*A. pedatum* follow Cooper *et al.* (1991).

Wetter habitat types such as western redcedar/lady fern (*Thuja plicata*/*Athyrium filix-femina*), western redcedar/oakfern (*T. plicata*/*Gymnocarpium dryopteris*), and western redcedar/woodfern (*T. plicata*/*Dryopteris* spp; Steele 1971), are typical of the lowest elevations, on toeslopes and terraces along the river, and are represented by plots no. 1 through 10 established in 1991 (Lichthardt 1992).

Western redcedar/wild ginger and western redcedar/maidenhair fern are the predominant habitat types in the RNA. Grand fir habitat types are relatively scarce, occurring mostly on warm aspects on the north side of the river where they are dominated by Douglas-fir. Stand 303-3-035 (plot 89) fits the description of the red alder/maidenhair fern association described from the North Fork by Steele (1971). Although red alder is normally a seral

species, these stands are considered to represent an edaphic climax resulting from unstable substrate conditions.

Seral status. Only about a third of the stands sampled are in late-seral or potential-natural-community (PNC) status as defined by Hall *et al.* (1995; Table 5). The remaining stands differ in composition and structure from the potential natural community characteristic of their habitat type. Table 6 lists the stands sampled within each habitat type along with their dominant species, structural condition, and seral status. Table 6 also includes 1991 plots (nos. 1-10) for completeness. The following discussion refers only to 1996 work.

Table 5. Seral status classes and criteria (Hall *et al.* 1995).

Class	Criteria
PNC	The potential natural community under existing environment; seral species scarce to absent.
Late seral	PNC species are dominant, but seral species still persist.
Mid seral	PNC species are approaching equal proportions with seral species.
Early seral	Clear dominance of seral species; PNC species absent or very low in cover; absence of a life-form layer such as absence of trees in a forest PNC.

Tree canopy cover by species and size class (Appendix B, Table 5), was used to classify forest communities as to seral status. Using the system of Hall *et al.* (1995), seral status was based on the relative dominance of PNC species versus seral species, regardless of the structural nature of the stand (Table 5). In applying this system, I considered the canopy layer with the largest foliar volume—generally not the sapling layer, which can have a cover exceeding that of the upper canopy. Intermediate classes (“early to mid seral” and “mid to late seral”) were also used where needed. The two major habitat types are represented by a range of seral stages from early-seral to PNC. Early-seral stands are slightly more common overall.

In both the western redcedar and grand fir series, early-seral stands tend to be dominated by even-age, medium Douglas-fir. Some have a component of large and very large survivors. In these stands saplings are generally sparse, a notable exception being plot 67 with a subcanopy of western redcedar saplings. Early-seral stands include the blowdown (plot 86) in which only Douglas-fir poles had any significant cover, and the Sam burn in which only large-tree survivors were present.

Mid- and late-seral stands were found only in the western redcedar and red alder series (Table 6). Mid-seral stands are typically mixtures of medium-size-class western redcedar and grand fir, often with a component of larger survivors. The structure is very variable depending on the presence of survivors or of a sapling subcanopy. Some mid-seral stands can have the character of old-growth due to the presence of large, western redcedar

survivors (for example see plot 69). Late-seral stands still have a component of grand fir. However, grand fir tends to persist as a subdominant into old-growth stages of the western redcedar series, as western white pine probably did at one time. Late-seral western redcedar stands were found from 2100 to 3900 ft elevation, on both warm and cool aspects.

Four of the thirty-one stands sampled represent the PNC of the site, three in the western redcedar/maidenhair fern habitat type and one in red alder/maidenhair fern. These stands are dominated by large and very large individuals, and contain large, downed logs. They tend to have low-forb understories, except where shrubs have been released in openings created by dead trees. Seven stands were noted as being old-growth western redcedar based on a combination of structure and composition, but most have a significant grand fir component and were thus classified as late seral. Late seral and PNC stands are more common in the wetter habitat types where stand-replacing fires are rare. All of the late-seral and PNC stands sampled were on landtype 50, "mass-wasted slopes", where slopes are significantly less steep than the other landtypes and less well-drained.

Structural condition. A structural condition was assigned to each stand based on the dominant diameter class (Table 6). In addition to dominant size class, structural condition also refers to vertical stratification of lifeforms within a stand.

The conifer-sapling layer is an important aspect of stand structure because saplings act as ladder fuels to carry a ground fire into the upper canopy. Where they contribute significant coverage, sapling conifers generally form a separate subcanopy. The only shrub species commonly found in the sapling layer is Rocky Mountain maple (*Acer glabrum*). None of the stands sampled are dominated by saplings. In a few instances, sapling cover exceeded that of the uppermost canopy layer but was subdominant in terms of volume. Only four plots (67, 81, 82, and 93) had sapling canopy cover codes greater than 20 (i.e., 15-25% cover). Sapling densities in these tenth-acre plots were 39, 39, 9, and 41 respectively. In all cases the sapling layer was dominated by either western redcedar or grand fir.

Although poles are considerably shorter than medium trees, their canopies typically merge with that of the medium-tree layer, forming a single canopy layer. This is also true of sapling hardwoods. Only two of the stands sampled are dominated by pole-size trees (plots 86 and 92). Plot 86 is in the 1994 blowdown in which some poles remained standing. Interestingly, plot 92 (stand 303-3-039) is considered to represent the PNC status due to the dominance of western redcedar. Medium trees and very large survivors are also present.

The dominant structural condition is that of medium trees, often a mixture of pole and medium, with open understories and only scattered saplings in the subcanopy. In 25 of the 31 stands sampled, including some stands with PNC status, the single dominant size class is medium trees (9-21 inches dbh), reflecting at least a 50-year interval since the last major fire. Large and very-large survivors of past fires are also commonly present, usually western redcedar and grand fir.

Table 6. Seral status and structural condition of the stands sampled, by plot number within habitat type. Plots 1-10 are monitoring plots established in 1991 and are included for completeness.

Habitat Type ¹	Plot No.	Dominant (-codominant) Species	Structural Condition ²	Seral Status ³	Approx. Date of Origin ⁴	Notes	Stand No. ⁶	Cover type from Stand map ⁶
Thupli/Dryopteris	2	Thupli	Large tree	PNC		-	303-04-020	NA
"	8	Abigra-Thupli	Med/lg tree	Mid seral		-	302-02-032	NA
Thupli/Athfil-Adiped	5	Thupli	Very-large tree	PNC		-	302-01-024	NA
Thupli/Adiped	1	Thupli	Large tree	PNC		-	313-07-045	NA
"	3	Thupli	Large tree	PNC		-	303-04-017	NA
"	4	Alnrub	Pole tree	Early		-	302-01-024	NA
"	6	Thupli	Med/lg tree	PNC		-	302-02-030	NA
"	7	Thupli	Very-large tree	PNC		-	303-04-009	Thupli
"	9	Alnru	Pole	Early seral		-	302-02-030	Thupli
"	63	Thupli-Abigra	Med/lg tree	Mid seral		w/ med. tree regen & surviv	303-04-019	Thupli
"	77	Abigra-Thupli	Med/lg tree	Mid seral	1901	-	302-01-003	Thupli
"	79, 80	Thupli	Large tree	PNC	1870	-	302-01-025	Abigra
"	81	Thupli	Large tree	PNC	1846	Subcanopy of Abigra saplings	313-07-045	Thupli
"	82	Thupli-Abigra	Pole/med tree	Mid seral		Closed canopy w/survivors	313-07-046	Abigra
"	83	Thupli	Med/lg tree	Late seral	1868	-	313-07-048	Abigra
"	92	Thupli	Pole tree	PNC		w/survivors	303-03-039	Thupli
"	94	Abigra-Psemen	Med/lg tree	Early seral	1941	30% hardwood cover	303-03-011	Psemen
"	95	Psemen-Abigra	Medium tree	Early seral	1946	-	303-03-030	Abigra
Thupli/Asacau	64 ⁵	Thupli	Large tree	Early seral		Recent burn w/survivors	303-04-024	Thupli
"	65	Abigra-Thupli	Med/lg tree	Mid to late seral	1836	w/survivors	303-04-027	Abigra
"	66	Thupli-Abigra	Medium tree	Mid seral	1936	Closed canopy	303-04-029	Psemen
"	67	Psemen	Medium tree	Early seral	1924	Subcanopy of Thupli saplings	303-04-039	Psemen
"	68	Psemen-Alnrub	Medium tree	Early seral	1935-41	-	303-04-035	Abigra
"	69	Abigra-Thupli	Med/lg tree	Mid seral	1886-96	Lg. and very lg. survivors	302-01-024	Abigra
"	70	Psemen	Medium tree	Early seral		-	302-01-023	Abigra

- Continued -

Table 6 cont.

Habitat Type ¹	Plot No.	Dominant (-codominant) Species	Structural Condition ²	Seral Status ³	Approx. Date of Origin ⁴	Notes	Stand No. ⁶	Cover type from Stand map ⁶
Thupli/Asacau	71	Thupli-Abigra	Med/lg tree	Late seral		w/survivors	302-01-021	Abigra
"	72	Thupli-Abigra	Med/lg tree	Late seral		-	302-01-020	Abigra
"	73	Psemen-Abigra	Medium tree	Early seral		-	302-01-017	Abigra
"	85	Thupli	Large tree	Late seral	1833	Subcanopy of pole/med Abigra	303-03-038	Thupli
"	87	Abigra	Medium tree	Early seral	1911	Closed canopy w/Alnrub	303-03-031	Psemen
"	90	Abigra-Thupli	Med/lg tree	Mid seral		-	303-03-037	Thupli
"	91	Abigra-Thupli	Med/lg tree	Early to mid seral		-	303-03-037	Thupli
"	93	Psemen	Medium tree	Early to mid seral		Subcanopy of Thupli saplings	303-03-040	Thupli
Thupli/Cliuni	10	Thupli	Large tree	Late seral		-	302-01-032	Abigra
"	88	Psemen	Medium tree	Early seral	1916	-	303-03-006	Psemen
Abigra/Asacau	74	Psemen	Medium tree	Early to mid seral		-	302-01-070	-
"	75	Psemen	Medium tree	Early seral		Canopy opened by disease	302-02-017	Psemen
"	76	Psemen	Medium tree	Early seral		-	302-02-033	Abigra
"	86 ⁵	Psemen	Pole tree	Early seral		Windthrow w/survivors	303-03-050	-
"	84	Psemen	Medium tree	Early seral	1906	-	302-01-030	Psemen
Alnrub/Adiped	89	Alnrub	Medium tree	PNC		-	303-03-035	Psemen
Shrubland	78	Philew	Tall shrub	Late seral		-	302-01-027	Psemen

¹ Follows Cooper *et al.* (1991) except *Alnus rubra*/*Adiantum pedatum* which follows Steele (1971). Species codes are derived from first three letters of genus name followed by first three letters of species name.

² Dominant (/codominant) size class of dominant life form (uppermost canopy). For trees this is based on diameter at breast height (dbh) in inches: pole (5-8.9"), medium (9-21.9"), large (22-32.9"), and very large (>32.9").

³ Follows Hall *et al.* (1995) as shown in Table 5, using relative dominance of climax species in canopy layer with largest foliar volume.

⁴ From age of tree(s) bored in dominant canopy layer.

⁵ Permanent plot.

⁶ Stand number and cover type are from Forest Service timber stand maps (1984) and the Timber stand management resource system (TSMRS; 1994), both available from the North Fork District, Clearwater National Forest.

Ten stands appear to have originated from stand-replacing fires as indicated by an absence of trees in the large or very-large size classes. These stands occur on both north and south aspects. Most are even-age stands of Douglas-fir with a uniform upper canopy and little layering. However, stand 320-1-70 (plot 74) has an open Douglas-fir overstory and a subcanopy of paper birch (*Betula papyrifera*). Stand 303-4-035 (plot 68) is an unusual, Douglas-fir–red alder stand with a very open understory and was the only such stand observed. Douglas-fir did not appear to be the PNC in any of the stands sampled. Stand 302-2-17 (plot 75) is a very open Douglas-fir stand typical of stands affected by root disease, in which tops of dead and dying trees have been wind-thrown.

Stands that are not even-aged generally contain large and very-large fire survivors, generally western redcedar and grand fir. Examples include plots 63, 65, 82, 85, 90, 93 and 94. Large individuals of western larch show up in only one plot (92). These fire survivors generally do not form a distinct upper stratum. Exceptions include three stands which have a distinct bimodal structure with a subcanopy of pole-medium regeneration (plots 92, 93, and 94). These were difficult to classify as to seral status because of the different species composition of the two strata. The upper canopies of these stands may have been opened up by white pine die-off, fire, or decadence.

Relationship of bioenvironment to forest communities. The sample size achieved here, given the large number of bioenvironments, is not sufficient to discern relationships between bioenvironment and forest cover type (composition and structure). An examination of habitat type and stand seral status within the different bioenvironments sampled indicates the following:

- All examples of potential natural communities (PNCs) occurred in western redcedar/maidenhair fern, or wetter, habitat types.
- Late-seral types were only found in western redcedar/wild ginger, or wetter, habitat types.
- Early and mid-seral types were fairly evenly divided between north and south canyonsides, with only slightly more on the north side (9 north vs. 6 south).
- Within the large expanses of landtype 50 south the river, the entire range of seral stages and habitat types were encountered.

Conclusions

Aquarius RNA encompasses not only good representation of both western redcedar and grand fir habitat types, but a range of seral stages and structural conditions within each. The pattern of forest communities is related to major interacting environmental variables, primarily parent material, slope, aspect, and fire history. Stand maps, based on aerial photo interpretation, delineate as accurately as possible the different communities (cover types) at a 1:24,000 scale. However, over time this pattern of communities will change as exemplified by the two disturbance patches created in 1994. Landscape-level monitoring should track such changes and, ideally, should include a more detailed monitoring level designed to detect changes in specific stands. This study was a first step toward detecting such changes in plant community patterns in the RNA. The data also have applications to RNA management and conservation of biodiversity.

Monitoring. The database created here is the first step toward a landscape-level monitoring strategy for the RNA. The objective is to detect changes in the pattern of

communities in the RNA resulting from fire, decadence, windthrow, disease and other natural processes that operate over long time periods and at a broad scale.

This study provides baseline data on seral status and structural conditions of a range of forest communities that are already delineated on a stand map of the RNA. The next step is to tie the plot locations used (Appendix A) to similar stand polygons, from an examination of current aerial photographs. In this way, a map of plant communities will be produced that can be used to track changes in the seral status and overstory composition of forest communities within the RNA. Some stands have stand-exam data from 1988 which may be helpful in creating this map. Permanent plots in disturbance patches already created, can be used to characterize community recovery from disturbance.

In addition, the data presented here can be used to select stands for more detailed monitoring. Stands targeted for detailed monitoring should represent the range of seral status and structural conditions shown in Table 6. A second criterion in monitoring site selection must also be accessibility. In addition to the permanent plots already established in the wettest habitat types, in the Sam burn, and in the 1994 blowdown, recommended stands for detailed monitoring, based on seral status, structural condition, and accessibility would be:

- Late seral/PNC: 302-1-021 (medium/large trees with survivors) and 313-7-045 (old-growth stand with a subcanopy of sapling grand fir).
- Mid-seral western redcedar/maidenhair fern: 313-7-046
- Mid-seral western redcedar/wild ginger: 302-1-024
- Early-seral western redcedar/wild ginger: 302-1-023
- Early-seral grand fir/wild ginger: 302-1-030 (medium-shrub understory)

A root-disease disturbance patch is represented by stand 302-2-017. However, this stand is somewhat difficult to access.

Management. Often, the most difficult decisions in RNA management revolve around fire policy. A knowledge of stand structure and fuels can be used to assess 1) the potential for uncontrollable wildfire, 2) the need for prescribed burning or other types of fuels management, and 3) the type of control policy required. Living and dead fuels represent an important parameter in determining fire management policy. Parameters measured in this study that are related to fuels include sapling density (Appendix B, Table 3), canopy cover of saplings, shrub cover, and dead wood cover (Appendix B, Table 4).

Only four plots (67, 81, 82, and 93) were indicative of significant ladder fuels as indicated by sapling cover greater than 45%. The crowns of pole-size trees were generally part of the uppermost canopy stratum. Four plots, 82, 86, 89, and 94, showed high amounts of ground fuels as indicated by dead wood cover greater than 10 percent. Plot 86 was within the 1994 Sam burn.

The fuel levels and tree densities described for most stands sampled in this study do not indicate excessively long fire intervals or a need for fuels management. Much of the RNA is in habitat types (western redcedar/maidenhair fern, western redcedar/ladyfern) in which cool, ground fires are characteristic. Also, the closed-canopy structure of most stands has produced open understories. There was a pronounced lack of a shrub layer in most stands.

The apparently natural condition of the stands sampled underlines the need for a fire policy which allows natural fires to burn under some conditions.

Conservation of biodiversity. In terms of biodiversity conservation, it is important to know the existing condition and quality of habitat types in the RNA. That is, the plant community currently occupying the site, whether it is in a relatively natural state, and if not, whether some active management is required. Data presented here indicate that community elements in the RNA are in excellent condition in terms of a lack of human impacts. Fuel levels and tree densities of most stands do not indicate excessively long fire intervals. Habitat types are represented by a range of seral communities, reflecting natural patterns of stand replacing, thinning, and ground fires. In this respect, the RNA represents an important reference area for fire regimes in these habitat types, which can be important to ecosystem management on adjoining lands.

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Appendix A

Maps

Map 1. Bioenvironments used to stratify the RNA

Map 2. Plot locations in relation to bioenvironments

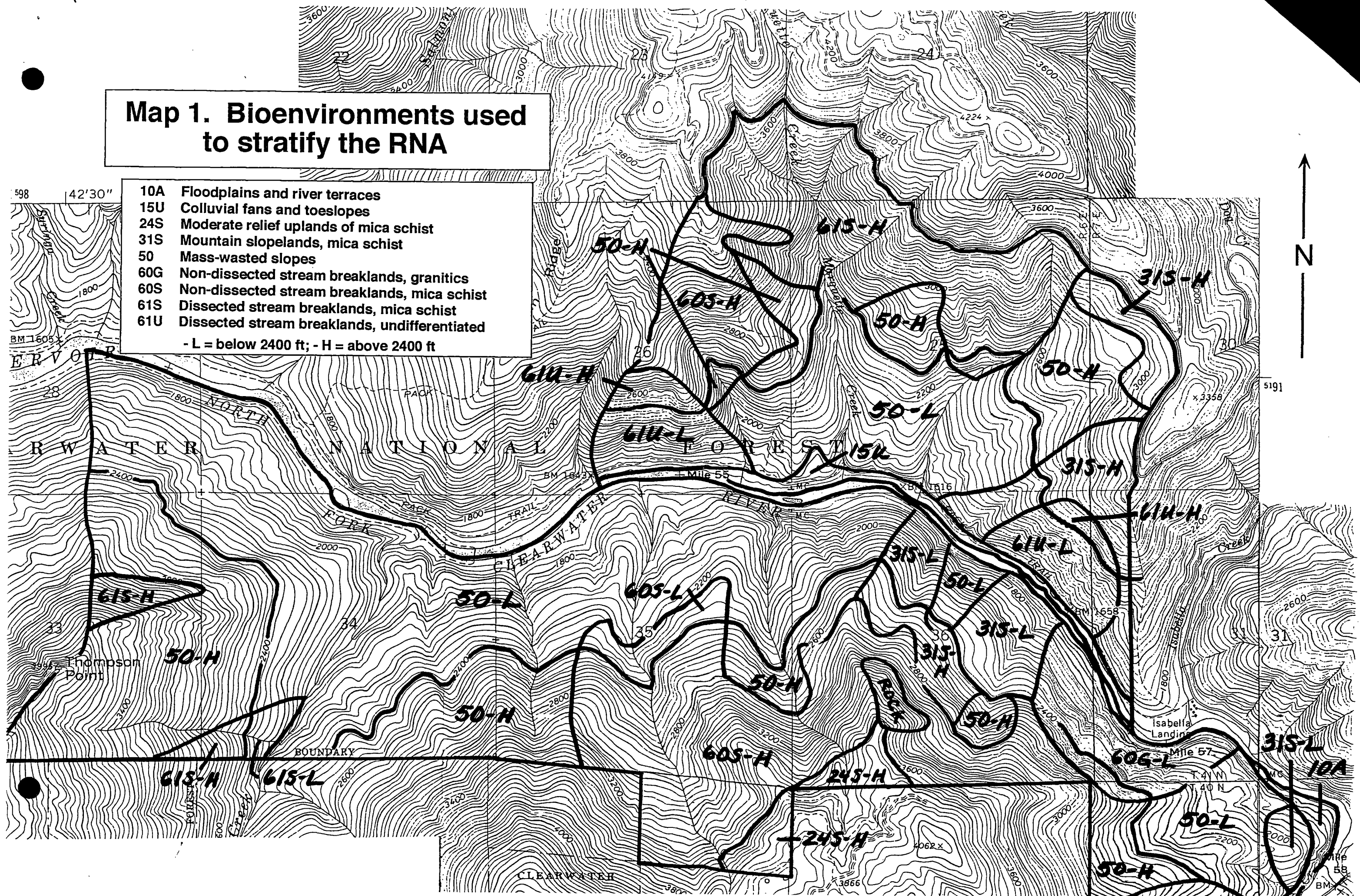
Map 3. Plot locations in relation to timber stands

Map 1. Bioenvironments used to stratify the RNA

Map 1. Bioenvironments used to stratify the RNA

- 10A Floodplains and river terraces
- 15U Colluvial fans and toeslopes
- 24S Moderate relief uplands of mica schist
- 31S Mountain slopelands, mica schist
- 50 Mass-wasted slopes
- 60G Non-dissected stream breaklands, granitics
- 60S Non-dissected stream breaklands, mica schist
- 61S Dissected stream breaklands, mica schist
- 61U Dissected stream breaklands, undifferentiated

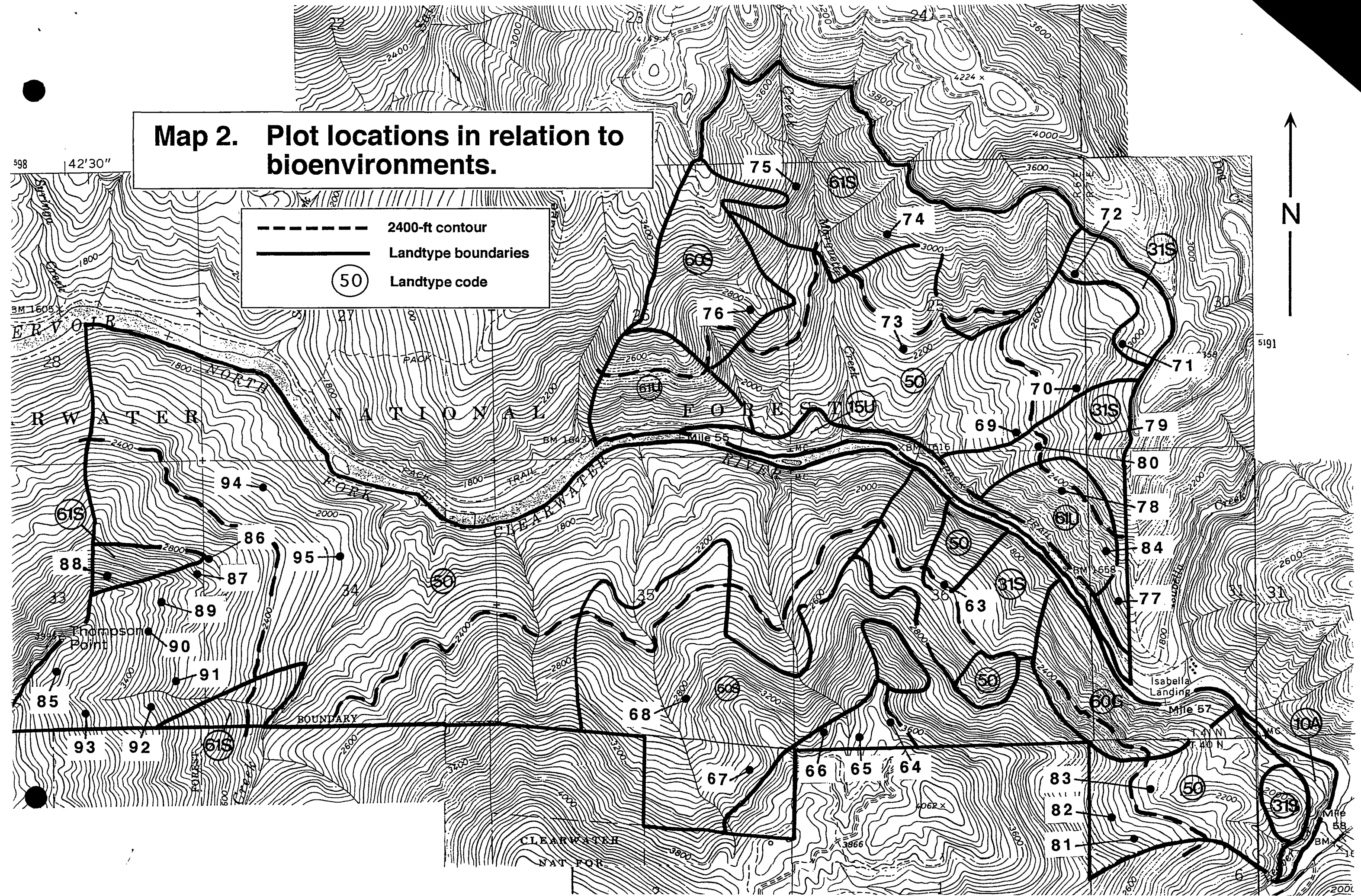
- L = below 2400 ft; - H = above 2400 ft



Map 2. Plot locations in relation to bioenvironments



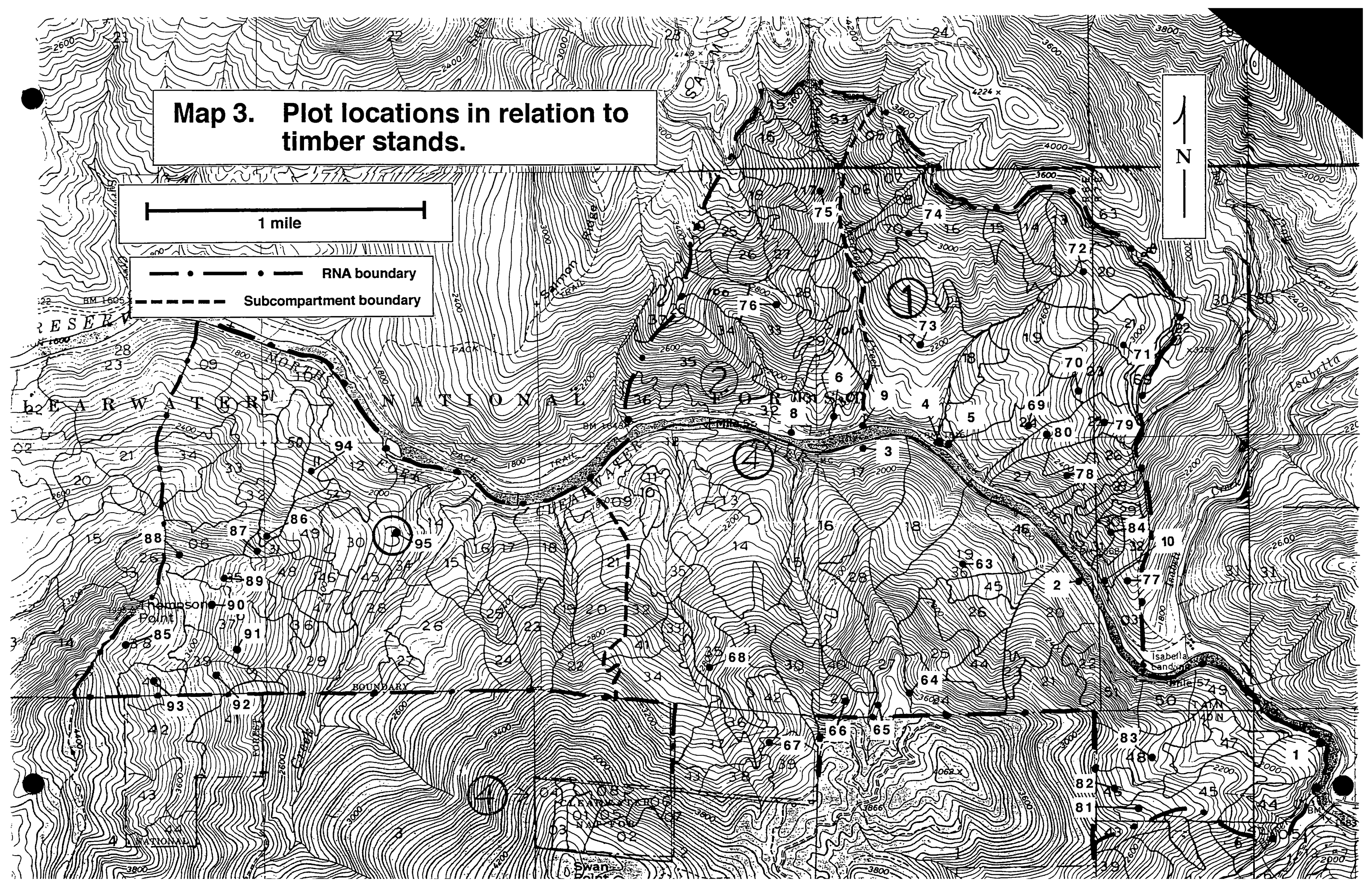
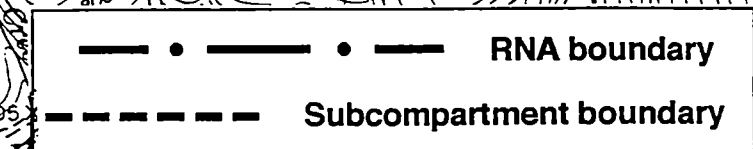
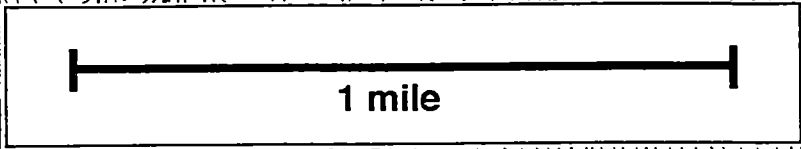
Map 2. Plot locations in relation to bioenvironments.



Map 3. Plot locations in relation to timber stands.



Map 3. Plot locations in relation to timber stands.



Appendix B

Tabled data from Ecodata forms

- Table 1. Ecodata, Location Linkage Form (LL).
- Table 2. Ecodata General Form (GF), Part 1: habitat type and vegetation layers.
- Table 3. Ecodata General Form (GF), Part 2: diameter, height, and age of trees in the dominant layer; basal area by size class; and tree density.
- Table 4. Ecodata General Form (GF), Part 3: site variables, downed wood, and tree cover by size class.
- Table 5. Ecodata Plant Composition Form (PC): tree cover by species and size class; and understory cover by life form. Cover is given as a cover class.
- Table 6. Comments from field data sheets, in order by plot number.

Table 1. Ecodata, Location linkage form (LL) ¹.

Plot ID	Comp	SubC	Stand	Quad Code	T	R	Sec	QS	QQS	Mer	LTA	Photos
96JL063	303	04	019	4611576	41N	06E	36	NE	SW	BO	50	N
96JL064	303	04	027	4611576	41N	06E	36	SW	SE	BO	24S45	Y
96JL065	303	04	027	4611576	40N	06E	36	SW	SW	BO	24S45	Y
96JL066	303	04	029	4611576	41N	06E	36	SW	SW	BO	24S45	Y
96JL067	303	04	039	4611576	40N	06E	02	NE	NE	BO	60S10	Y
96JL068	303	04	035	4611576	41N	06E	35	SE	SW	BO	60S10	Y
96JL069	302	01	024	4611576	41N	06E	25	SE	SE	BO	50	Y
96JL070	302	01	023	4611576	41N	06E	25	SE	SE	BO	50	Y
96JL071	302	01	021	4611576	41N	07E	30	SW	NW	BO	31S10	Y
96JL072	302	01	020	4611576	41N	06E	25	NE	SE	BO	31S10	Y
96JL073	302	01	017	4611576	41N	06E	25	SW	NE	BO	50	Y
96JL074	302	01	070	4611576	41N	06E	25	NW	NE	BO	61S20	Y
96JL075	302	02	017	4611576	41N	06E	25	NW	NW	BO	61S20	Y
96JL076	302	02	033	4611576	41N	06E	26	NE	SE	BO	60S26	Y
96JL077	302	01	003	4611576	40N	07E	31	NW	SW	BO	31S20	Y
96JL078	302	01	027	4611576	40N	06E	36	NE	NE	BO	61U30	Y
96JL079	302	01	025	4611576	41N	07E	30	SW	SW	BO	31S10	Y
96JL080	302	01	025	4611576	41N	06E	25	SE	SE	BO	31S10	Y
96JL081	313	07	045	4611576	40N	07E	06	NW	SW	BO	50	Y
96JL082	313	07	046	4611576	40N	07E	06	NW	NW	BO	50	Y
96JL083	313	07	048	4611576	40N	07E	06	NW	NW	BO	50	Y
96JL084	302	01	030	4611576	41N	07E	31	NW	SW	BO	61U30	N
96JL085	303	03	038	4611576	41N	06E	33	SE	NW	BO	50	Y
96JL086	303	03	050	4611576	41N	06E	34	NW	SW	BO	50	Y
96JL087	303	03	031	4611576	41N	06E	33	NE	SE	BO	50	Y
96JL088	303	03	006	4611576	41N	06E	33	NE	SW	BO	61S20	Y
96JL089	303	03	035	4611576	41N	06E	33	SE	NE	BO	50	Y
96JL090	303	03	037	4611576	41N	06E	33	SE	NE	BO	50	Y
96JL091	303	03	037	4611576	41N	06E	33	SE	SE	BO	50	Y
96JL092	303	03	039	4611576	41N	06E	33	SE	SE	BO	50	Y
96JL093	303	03	040	4611576	41N	06E	33	SE	SW	BO	50	Y
96JL094	303	03	011	4611576	41N	06E	34	NW	NW	BO	50	Y
96JL095	303	03	030	4611576	41N	06E	34	NW	SE	BO	50	Y

¹ Data fields in order are: Plot ID number, compartment number, subcompartment number, stand number, quadrangle code, township, range, section, quarter section, quarter of the quarter section, meridian (Boise), landtype association, and existence of a photo.

Table 2. Ecodata General Form, Part 1: habitat type and vegetation layers¹.

I.D.	MO	DA	HT ²	LSC ³	DSC ³	ULD Sp1	ULD Sp2	MLD Sp1	MLD Sp2	LLD Sp1	LLD Sp2
96JL063	6	3	560	MT	SA	THUPLI	ABIGRA	NP	NP	ADIPED	POLMUN
96JL064	6	4	546	MT	SA	THUPLI	NP	NP	NP	NP	NP
96JL065	6	4	546	MT	NP	ABIGRA	THUPLI	VACMEM	ABIGRA	DISHOO	SMISTE
96JL066	6	5	546	MT	SA	PSEMEN	ABIGRA	NP	NP	NP	NP
96JL067	6	5	546	MT	PO	PSEMEN	THUPLI	THUPLI	NP	NP	NP
96JL068	6	5	546	MT	NA	ALNRUB	PSEMEN	NP	NP	SMISTE	CIRALP
96JL069	6	10	546	MT	NA	ABIGRA	THUPLI	NP	NP	DISHOO	COPOCC
96JL070	6	10	546	MT	NA	PSEMEN	ABIGRA	NP	NP	SMISTE	ASACAU
96JL071	6	10	546	MT	MT	THUPLI	ABIGRA	NP	NP	DISHOO	SMISTE
96JL072	6	10	546	MT	NP	ABIGRA	THUPLI	NP	NP	TIATRI	COPOCC
96JL073	6	11	546	MT	PT	PSEMEN	ABIGRA	ABIGRA	ACEGLA	ADEBIC	DISHOO
96JL074	6	11	517	MT	NA	PSEMEN	BETPAP	PHILEW	NP	ADEBIC	PTEAQU
96JL075	6	11	517	MT	MT	PSEMEN	NP	PHYMAL	HOLDIS	CIRALP	POLMUN
96JL076	6	11	517	MT	PT	PSEMEN	NP	PHYMAL	HOLDIS	PTEAQU	ADEBIC
96JL077	6	12	560	MT	SA	ABIGRA	THUPLI	SYMALB	NP	POLMUN	ADIPED
96JL078	6	12	030	TS	NA	PHILEW	PRUEMA	HOLDIS	PHYMAL	BROJAP	AGRSPI
96JL079	6	12	560	LT	NA	THUPLI	ABIGRA	NP	NP	POLMUN	ADIPED
96JL080	6	12	560	LT	?	THUPLI	ABIGRA	THUPLI	NP	ADIPED	POLMUN
96JL081	6	14	560	LT	SA	THUPLI	ABIGRA	ABIGRA	NP	FERN	NP
96JL082	6	14	560	MT	SA	THUPLI	ABIGRA	THUPLI	ABIGRA	NP	NP
96JL083	6	14	560	MT	PT	THUPLI	ABIGRA	ABIGRA	NP	ADIPED	GYMDRY
96JL084	6	26	517	MT	MT	PSEMEN	HOLDIS	SYMALB	HOLDIS	CIRALP	MONSIB
96JL085	7	29	546	LT	SA	THUPLI	ABIGRA	TREE	NP	DISHOO	TIATRI
96JL086	7	30	517	PT	PT	ALNRUB	ABIGRA	SHRUB	NP	GALAPA	BROVUL
96JL087	7	30	546	MT	SA	ABIGRA	PSEMEN	NP	NP	DISHOO	FORB
96JL088	7	31	531	MT	SA	PSEMEN	ABIGRA	SHRUB	NP	DISHOO	SMISTE
96JL089	7	31	050	MT	PT	ALNRUB	ACEGLA	ATHFIL	NP	SMISTE	MONSIB
96JL090	7	31	546	MT	SA	THUPLI	ABIGRA	NP	NP	FORB	NP
96JL091	8	1	546	MT	MT	ABIGRA	THUPLI	NP	NP	SMISTE	ADEBIC
96JL092	8	1	560	PO	PT	THUPLI	ACEGLA	NP	NP	ASACAU	FORB
96JL093	8	1	546	SA	SA	PSEMEN	THUPLI	THUPLI	NP	FORB	NP
96JL094	8	30	560	MT	SA	ABIGRA	ALNRUB	NP	NP	SMISTE	ADIPED
96JL095	8	30	560	MT	SA	PSEMEN	ABIGRA	NP	NP	TIATRI	ADIPED

¹ Data fields are, in order: plot i.d., month, day, habitat type code², dominant live size class³, dom. dead size class³, upper layer dom. species, upper layer subdom. species, middle layer (2.5-6.5') dominant species, middle layer subdominant species, lower layer dom. species, and lower layer subdominant species (see USDA Forest Service 1991 for further explanation). NP = not present.

Table 2 cont.

²HTs: 030 Shrubland

050 Hardwood forest (ALNUS RUBRA)

517 ABIES GRANDIS/ASARUM CAUDATUM-ASARUM CAUDATUM

531 THUJA PLICATA/CLINTONIA UNIFLORA-CLINTONIA UNIFLORA

546 THUJA PLICATA/ASARUM CAUDATUM-ASARUM CAUDATUM

560 THUJA PLICATA/ADIANUM PEDATUM

³ Tree size classes: Sapling (<5" dbh; > 5' tall), Pole (5-9 in. dbh), MT = medium tree (9-21 in.), LT = large tree (21-33 in). Dead size classes the same. NA = not applicable.

Table 3. Ecodata General Form (GF), Part 2: diameter, height and age of trees in the dominant layer; basal area by size class, and tree density.

Plot ID ¹	BAF	DBH	Ht	Age	Sp ²	# saplings /0.1 ac	Basal Area				C	GF	Trees/acre ²					Total
							Po	Med	Lg	VLg			DF	L	WP	A		
							sq ft/acre											
96JL063	40	-	-	-	-	3	40	80	80	120	-	-	-	-	-	-	-	
96JL064	20	-	100	-	C	1	0	20	60	0	-	-	-	-	-	-	-	
96JL065	20	28.0	90	160	GF	13	20	40	60	20	-	-	-	-	-	-	-	
96JL066	20	12.0	85	40	C	15	40	200	0	0	-	-	-	-	-	-	-	
x		10.0	-	60	DF	-	-	-	-	-	-	-	-	-	-	-	-	
96JL067	20	-	100	72	DF	39	60	280	0	0	-	-	-	-	-	-	-	
96JL068	20	19.0	90	60	DF	7	60	140	0	0	-	-	-	-	-	-	-	
x		13.0	80	55	A	-	-	-	-	-	-	-	-	-	-	-	-	
96JL069	20	19.0	-	-	-	1	0	160	80	0	-	-	-	-	-	-	-	
*	20	29.0	134	110	GF	0	0	100	140	100	80	51	0	0	0	0	130	
x		21.5	-	100	GF	-	-	-	-	-	-	-	-	-	-	-	-	
96JL070	20	19.0	-	-	-	-	20	300	0	0	-	-	-	-	-	-	-	
96JL071	20	22.0	-	-	-	0	0	60	180	60	-	-	-	-	-	-	-	
96JL072	20	-	155	-	-	1	0	300	80	20	-	-	-	-	-	-	-	
96JL073	20	15.5	101	-	-	4	20	100	160	0	-	-	-	-	-	-	-	
96JL074	20	19.0	86	-	-	0	40	240	60	0	-	-	-	-	-	-	-	
96JL075	20	16.0	111	-	DF	0	20	60	0	0	-	-	-	-	-	-	-	
96JL076	20	-	122	-	DF	0	0	300	20	0	-	-	-	-	-	-	-	
96JL077	20	20.5	140	-	-	0	20	160	60	0	-	-	-	-	-	-	-	
*	20	21.8	134	95	GF	2	0	100	200	0	23	99	0	0	0	0	122	
96JL078	-	-	-	-	-	0	0	0	0	0	0	0	0	0	0	0	0	
96JL079	20	22.0	125	-	-	0	0	80	180	20	-	-	-	-	-	-	-	
*	20	21.6	105	125	C	2	0	80	200	100	74	64	0	0	0	0	138	
96JL080	20	35.0	125	-	C	1	0	60	80	140	-	-	-	-	-	-	-	
96JL081	20	27.5	95	-	-	39	0	80	140	0	-	-	-	-	-	-	-	
*	20	7.5	44	65	C	84	20	0	280	80	143	7	4	0	0	0	154	
x	20	26.5	134	150	GF	-	-	-	-	-	-	-	-	-	-	-	-	
96JL082	20	12.5	72	-	C	9	0	140	60	0	-	-	-	-	-	-	-	
*	20	10.5	77	78	C	7	20	80	120	60	166	0	87	0	3	0	256	
x	20	21.0	116	-	C	-	-	-	-	-	-	-	-	-	-	-	-	
96JL083	20	23.0	140	-	-	2	0	240	60	40	-	-	-	-	-	-	-	
*	20	31.0	-	220	C	8	0	100	160	80	113	31	3	0	3	0	150	
x	20	19.5	128	128	C	-	-	-	-	-	-	-	-	-	-	-	-	
x	20	10.0	-	78	C	-	-	-	-	-	-	-	-	-	-	-	-	

Table 3 cont.

Plot ID ¹	BAF	DBH	Ht	Age	Sp ³	Saplings/ 0.1 ac	Basal Area ²				C	Trees/acre ³					Total
							Po	Med	Lg	VLg		GF	DF	L	WP	A	
							sq ft/acre										
96JL084	20	17.0	97	91	DF	0	20	180	20	0	0	0	204	0	0	0	204
x		10.3	-	90	DF	-	-	-	-	-	-	-	-	-	-	-	-
96JL085	20	24.7	-	163	-	10	20	20	140	60	30	100	0	0	0	0	130
96JL086	20	13.0	50	-	A	1	-	-	-	-	-	-	-	-	-	-	-
96JL087	20	-	-	85	GF	3	40	160	0	0	0	231	25	0	0	45	302
96JL088	20	13.5	97	80	DF	4	0	200	0	0	0	0	210	0	0	0	210
96JL089	20	18.0	-	-	A	1	0	60	60	20	6	0	0	4	0	53	62
96JL090	20	19.4	-	-	-	10	0	180	160	0	62	87	7	27	0	0	184
96JL091	20	8.9	50	-	C	5	20	60	140	0	56	34	0	29	0	0	119
x		31.0	160	-	GF	-	-	-	-	-	-	-	-	-	-	-	-
96JL092	20	-	-	-	-	12	60	60	0	180	184	50	0	59	0	72	364
96JL093	20	23.2	135	-	DF	41	20	140	60	0	30	73	97	0	0	19	220
x		11.0	70	-	C	-	-	-	-	-	-	-	-	-	-	-	-
96JL094	20	16.8	107	55	DF	6	40	60	60	0	0	23	36	0	0	132	191
96JL095	20	16.0	130	50	GF	2	20	160	20	0	5	39	126	0	0	0	170
x		13.9	109	-	DF	-	-	-	-	-	-	-	-	-	-	-	-

¹ x = extra tree measured in preceeding plot.

* = additional tree data from a second plot in vicinity of original plot.

² western redcedar (C), grand fir (GF), Douglas-fir (DF), western larch (L), western white pine (WP), red alder (A).

Table 4. Ecodata General Form (GF), Part 3: Site variables, dead wood cover, dominant layer height, tree cover by size class¹, shrub cover, and herbaceous cover by life form.

Plot ID	Elev	Asp	Slope	DWC	DL	DLht	TC	SE	SA	PO	ME	LG	VL	STot	Low	Mid	Tall	Gram	Forb	Fern	Moss
96JL063	2400	20	70	5	10	120	80	1	3	10	40	30	20	10	3	1	3	1	20	40	1
96JL064	3650	30	40	3	-	100	40	1	1	0	10	30	0	1	1	0	0	1	10	1	1
96JL065	3700	260	25	10	14	90	80	1	20	10	30	40	0	20	10	10	0	1	40	3	1
96JL066	3480	320	60	3	8	85	99	1	10	20	90	0	0	1	1	0	0	0	1	1	0
96JL067	3400	290	50	5	-	100	99	3	70	20	50	0	0	1	1	0	0	0	1	1	0
96JL068	2850	280	65	3	5	90	90	1	10	30	50	0	0	1	1	1	10	1	50	3	1
96JL069	2300	230	40	7	12	120	90	1	1	20	50	30	20	1	1	1	0	1	40	10	1
96JL070	2700	270	50	2	4	-	80	1	10	20	80	0	0	10	10	3	3	1	70	3	1
96JL071	2960	200	25	3	12	-	90	1	0	3	70	50	30	3	3	0	0	1	40	3	1
96JL072	2900	215	10	2	6	155	99	0	1	3	40	20	20	1	1	0	0	1	40	3	1
96JL073	2260	200	63	7	-	100	80	1	10	20	60	10	0	20	1	0	20	3	70	20	3
96JL074	3000	210	64	3	8	85	70	0	0	20	60	20	0	30	3	1	30	1	70	20	0
96JL075	2960	135	82	10	11	110	40	1	0	3	30	0	0	40	10	20	3	10	70	30	0
96JL076	2780	320	-	2	-	120	80	1	0	1	80	10	0	30	10	20	3	1	80	20	0
96JL077	2100	230	48	9	2	135	60	0	0	10	30	30	0	20	10	20	3	1	40	70	10
96JL078	2320	200	84	0	-	-	0	0	0	0	0	0	0	50	3	40	30	50	30	1	1
96JL079	2750	310	56	2	5	125	99	1	0	20	30	50	20	0	1	0	0	0	3	20	1
96JL080	2380	320	60	10	17	125	70	1	1	10	20	30	40	10	10	1	3	1	30	50	1
96JL081	2600	30	55	7	12	95	99	3	80	10	30	30	20	1	1	0	0	1	10	3	10
96JL082	2600	110	55	25	10	125	99	1	30	20	80	20	0	1	1	0	0	1	1	3	1
96JL083	2300	55	23	8	14	140	90	1	10	20	90	20	0	1	1	0	0	1	30	20	40
96JL084	2180	245	80	1	3	100	80	1	0	3	70	10	0	30	20	30	10	3	50	10	20
96JL085	3880	85	25	10	12	150	80	3	10	20	30	30	10	20	10	0	10	1	20	3	3
96JL086	2820	70	35	20	11	50	10	1	3	3	3	0	0	10	3	10	0	30	70	10	-
96JL087	2960	30	60	10	10	-	99	1	3	20	90	0	0	10	3	0	3	1	30	10	3
96JL088	3400	40	70	6	7	-	90	3	3	30	80	0	0	20	20	10	10	1	20	1	10
96JL089	3200	40	850	15	12	-	80	1	1	0	60	20	3	10	1	1	10	20	50	50	1
96JL090	3300	85	50	3	8	-	99	1	20	10	80	40	0	3	3	0	0	0	10	1	1
96JL091	2980	100	38	3	12	160	80	1	10	30	40	30	0	20	10	1	10	3	30	10	1
96JL092	3180	68	47	7	-	-	90	1	20	80	20	0	30	10	1	3	10	1	10	10	1
96JL093	3650	75	45	4	9	125	90	1	50	50	30	20	0	1	1	0	0	1	10	3	1
96JL094	2080	60	40	12	8	110	80	1	10	20	40	20	0	3	3	1	1	3	20	20	1
96JL095	2080	65	42	10	6	130	90	0	3	20	80	0	0	3	3	1	0	1	50	20	1

¹Data fields in order are: plot i.d. no., elevation, aspect (degrees), slope (%), dead wood cover (%); ave. down log diameter (in.); dominant layer height (ft; canopy layer with the greatest volume); total cover of trees as a life form; SE = seedlings (<5 ft tall); SA = saplings (<5 inches dbh); PO = poles (5-9 in); ME = medium (9-21 in); LG = large (21-33 in); and VL = very large (>33 in); total shrub cover, low shrub cover (<2.5'), medium shrub cover (2.5-6.5'), tall shrub cover (>6.5'); cover of graminoids; forbs; ferns; and mosses.

Table 5. Ecodata Plant Composition Form (PC): Tree cover by species and size class; and understory cover by life form. Cover is given as a cover class¹.

Plot I.D.	Sp	Total	Cover Class					
			Tree layer ² : Shrub layer ³ :	Seed Low	Sap Pole Mid Tall	Med	Lg	Vlg
96JL063	THUPLI	40		1	3	10	-	30
	ABIGRA	30		1	3	-	30	-
	PSEMEN	20		-	-	1	10	-
	ALNRUB	3		-	-	-	3	-
	SHRUB	10		3	1	3	-	-
	GRAM	1						
	FORB	20						
	FERN	40						
	MOSS	1						
96JL064	THUPLI	30		-	1	-	-	30
	ABIGRA	3		1	-	-	3	-
	SHRUB	1		1	-	-		-
	GRAM	1						
	FORB	10						
	FERN	1						
96JL065	THUPLI	30		1	1	-	10	20
	ABIGRA	50		1	20	10	20	20
	PINMON	1		1	-	-	-	-
	BETPAP	3		-	-	3	-	-
	SHRUB	20		10	10	-		
	GRAM	1						
	FORB	40						
	FERN	3						
	MOSS	1						
96JL066	THUPLI	40		1	10	10	30	-
	ABIGRA	40		-	-	10	30	-
	PSEMEN	20		-	-	1	30	-
	ALNRUB	3		-	-	3	-	-
	SHRUB	1		1	-	-		
	GRAM	-						
	FORB	1						
	FERN	1						
	MOSS	-						
96JL067	THUPLI	70		3	60	10	10	-
	ABIGRA	1		-	-	1	1	-
	PSEMEN	40		-	1	10	40	-
	SHRUB	1		1	-	-		
	GRAM	-						
	FORB	1						
	FERN	1						
96JL068	THUPLI	10		1	1	1	3	-
	ABIGRA	3		1	1	-	3	-
	PSEMEN	40		-	3	1	40	-
	ALNRUB	60		-	10	30	20	-
	BETPAP	3		-	-	3	-	-
	SHRUB	1		1	1	10		

Table 45 cont.

		Tree layer ² :	Seed	Sap	Pole	Med	Lg	Vlg
		Shrub layer ³ :	Low	Mid	Tall			
96JL069	GRAM	1						
	FORB	50						
	FERN	3						
	MOSS	1						
	THUPLI	30	1	1	10	10	10	20
	ABIGRA	70	1	-	10	40	20	-
	SHRUB	1	1	1	-			
	GRAM	1						
961JL070	FORB	40						
	FERN	10						
	MOSS	1						
	THUPLI	3	-	-	3	-	-	-
	ABIGRA	20	1	3	10	20	-	-
	PSEMEN	70	-	-	10	60	-	-
	BETPAP	30	-	10	20	-	-	-
	SHRUB	10	10	3	3			
96JL071	GRAM	1						
	FORB	70						
	FERN	3						
	MOSS	1						
	THUPLI	70	-	-	3	40	20	30
	ABIGRA	50	1	-	-	40	10	-
	SHRUB	3	3	-	-			
	GRAM	1						
96JL072	FORB	40						
	FERN	3						
	MOSS	1						
	THUPLI	40	-	1	-	20	10	20
	ABIGRA	50	-	-	3	20	30	-
	PSEMEN	40	-	-	-	30	10	-
	SHRUB	1	1	-	-			
	GRAM	1						
96JL073	FORB	40						
	FERN	3						
	MOSS	1						
	ABIGRA	40	1	10	20	20	-	-
	PSEMEN	60	-	-	10	40	10	-
	BETPAP	20	-	-	-	20	-	-
	SHRUB	20	1	0	20			
	GRAM	3						
96JL074	FORB	70						
	FERN	20						
	MOSS	3						
	ABIGRA	20	-	-	-	20	-	-
	PSEMEN	40	-	-	20	30	20	-
	BETPAP	40	-	-	30	10	-	-
	SHRUB	30	3	1	30			
	GRAM	1						
	FORB	70						
	FERN	20						
	MOSS	-						

Table 5 cont.

		Tree layer ² : Shrub layer ³ :	Seed Low	Sap Mid	Pole Tall	Med	Lg	Vlg
96JL075	ABIGRA	3	1	-	3	3	-	-
	PSEMEN	30	-	-	3	30	-	-
	SHRUB	40	10	20	3			
	GRAM	10						
	FORB	70						
	FERN	30						
	MOSS	-						
96JL076	ABIGRA	1	1	-	-	-	-	-
	PSEMEN	80	-	-	1	80	10	-
	SHRUB	30	10	20	3			
	GRAM	1						
	FORB	80						
	FERN	20						
	MOSS	-						
96JL077	THUPLI	20	-	-	-	-	20	-
	ABIGRA	40	-	-	10	20	20	-
	PSEMEN	20	-	-	-	20	-	-
	TAXBREV	1	-	-	1	-	-	-
	SHRUB	20	10	20	3			
	GRAM	1						
	FORB	40						
	FERN	70						
	MOSS	10						
96JL078	SHRUB	50	3	40	30			
	GRAM	50						
	FORB	30						
	FERN	1						
	MOSS	1						
96JL079	THUPLI	90	-	-	20	30	50	-
	ABIGRA	10	1	-	-	10	3	-
	SHRUB	1	1	-	-			
	GRAM	-						
	FORB	3						
	FERN	20						
	MOSS	1						
96JL080	THUPLI	70	1	-	10	10	30	40
	ABIGRA	10	1	1	-	10	-	-
	SHRUB	10	10	1	3			
	GRAM	1						
	FORB	30						
	FERN	50						
	MOSS	1						
96JL081	THUPLI	-	1	3	10	30	40	20
	ABIGRA	-	1	70	10	-	10	-
	PSEMEN	-	-	3	-	-	-	-
	ALNRUB	1	-	-	-	1	-	-
	SHRUB	1	1	0	0			
	GRAM	1						
	FORB	10						
	FERN	3						
	MOSS	10						

Table 5 cont.

		Tree layer ² : Shrub layer ³ :	Seed	Sap	Pole	Med	Lg	Vlg
			Low	Mid	Tall			
96JL082	THUPLI	70	1	20	20	40	20	-
	ABIGRA	60	1	30	10	30	20	-
	PSEMEN	20	-	-	-	20	-	-
	SHRUB	1	1	-	-			
	GRAM	1						
	FORB	1						
	FERN	3						
	MOSS	1						
96JL083	THUPLI	70	1	-	-	70	20	-
	ABIGRA	50	1	10	20	20	10	-
	SHRUB	1	1	-	-			
	GRAM	1						
	FORB	30						
	FERN	20						
	MOSS	40						
96JL084	ABIGRA	1	1	-	-	-	-	-
	PSEMEN	70	-	-	10	70	10	-
	SHRUB	30	20	30	10			
	GRAM	3						
	FORB	50						
	FERN	10						
	MOSS	20						
96JL085	THUPLI	-	3	10	-	-	30	10
	ABIGRA	-	1	10	20	30	10	-
	PSEMEN	-	1	-	-	3	-	-
	SHRUB	20	10	-	10			
	GRAM	1						
	FORB	20						
	FERN	3						
	MOSS	3						
96JL086	ABIGRA	-	1	3	3	3	-	-
	PSEMEN	-	1	3	30	3	-	-
	ALNRUB	-	1	10	3	3	-	-
	SHRUB	10	3	10	-			
	GRAM	30						
	FORB	70						
	FERN	10						
	MOSS	M						
96JL087	ABIGRA	70	1	10	10	70	-	-
	PSEMEN	20	-	-	-	20	-	-
	ALNRUB	20	-	10	10	3	-	-
	BETPAP	3	-	3	-	-	-	-
	SHRUB	10	3	-	3			
	GRAM	1						
	FORB	30						
	FERN	10						
	MOSS	3						

Table 5' cont.

		Tree layer ² :	Seed	Sap	Pole	Med	Lg	Vlg
		Shrub layer ³ :	Low	Mid	Tall			
96JL088	THUPLI	-	3	10	10	-	-	-
	ABIGRA	-	1	-	10	-	-	-
	PSEMEN	-	1	-	20	80	-	-
	SHRUB	20	20	10	10			
	GRAM	1						
	FORB	20						
	FERN	1						
	MOSS	10						
96JL089	THUPLI	-	1	-	-	-	3	3
	ABIGRA	-	-	1	-	-	-	-
	ALNRUB	-	-	-	-	60	20	-
	SHRUB	10	1	1	10			
	GRAM	20						
	FORB	50						
	FERN	50						
	MOSS	1						
96JL090	THUPLI	60	1	10	10	10	40	-
	ABIGRA	80	1	10	-	70	-	-
	PSEMEN	10	-	-	-	10	1	-
	LAROCC	10	-	-	-	10	-	-
	SHRUB	3	3	-	-			
	GRAM	-						
	FORB	10						
	FERN	1						
96JL091	THUPLI	-	1	10	30	-	10	-
	ABIGRA	-	1	-	-	40	10	-
	LAROCC	-	-	-	-	-	20	-
	ALNRUB	-	-	-	3	-	-	-
	SHRUB	20	10	1	10			
	GRAM	3						
	FORB	30						
	FERN	10						
96JL092	THUPLI	-	1	20	60	20	-	30
	ABIGRA	-	1	10	10	-	-	-
	ALNRUB	-	-	-	10	10	-	-
	SHRUB	10	1	3	10			
	GRAM	1						
	FORB	10						
	FERN	10						
	MOSS	1						
96JL093	THUPLI	-	1	50	30	10	-	-
	ABIGRA	-	-	3	10	10	-	-
	PSEMEN	-	-	-	10	20	20	-
	LAROCC	-	-	-	-	1	-	-
	ALNRUB	-	-	-	-	10	-	-
	SHRUB	1	1	-	-			
	GRAM	1						
	FORB	10						
	FERN	3						
	MOSS	1						

Table 5 cont.

		Tree layer ² :	Seed	Sap	Pole	Med	Lg	Vlg
		Shrub layer ³ :	Low	Mid	Tall			
96JL094	ABIGRA	20	-	10	10	3	20	-
	PSEMEN	20	-	-	-	20	-	-
	LAROCC	1	-	-	1	-	-	-
	PINMON	1	-	1	-	-	-	-
	ALNRUB	20	-	-	10	10	-	-
	BETPAP	10	-	-	3	10	-	-
	SHRUB	3	3	1	1			
	GRAM	3						
	FORB	20						
	FERN	20						
	MOSS	1						
99JL095	ABIGRA	40	-	3	20	40	-	-
	PSEMEN	70	-	-	3	60	-	-
	LAROCC	1	-	-	1	-	-	-
	ALNRUB	1	-	-	1	-	-	-
	SHRUB	3	3	1	0			
	GRAM	1						
	FORB	50						
	FERN	20						
	MOSS	1						

¹ Cover classes: < 1% (1), 1-5% (3), 5-15% (10), 15-25 (20), 25-35 (30), 35-45 (40), 45-55 (50), 55-65 (60), 65-75 (70), 75-85 (80), 85-95 (90), and >95 (99). - = not present.

² For trees: SEEDlings = < 5 ft tall; SAPlings = < 5" dbh; POles = 5-9" dbh; MEDium = 9-21" dbh; Lg = 21-33" dbh; VLg = > 33 in dbh.

³ For shrubs: Low = < 2.5 ft; medium = 2.5 to 6.5 ft; and tall = > 6.5 ft.

Table 6. Comments—in order by plot number.

Note: “cedar” refers to western redcedar (*Thuja plicata*); references to tree diameter (sapling, pole, medium, large, and very large) correspond to explicit size classes given in Appendix B, Table 3. “Middle layer” refers to the lowest tree canopy layer.

Stand no.: 303-04-019 Plot no.: 063

Very large cedars are fire-scarred. Photos of this stand did not turn out.

Stand no.: 303-04-024 Plot no.: 064

1994 “Sam” burn; permanent plot on border between small stand-killing patch dominated by pole/medium grand fir and underburn dominated by medium cedar and grand fir. Plot center is on upslope side of large grand fir with broken top.

Stand no.: 303-04-027 Plot no.: 065

Western white pine deadfall just west off of burned ridge. Large trees released ca. 60 yrs ago; possibly coinciding with western white pine die-off. Stand at large is dominated by medium trees.

Stand no.: 303-04-029 Plot no.: 066

Closed stand with depauperate understory; competition-limited. Moderate amount of downed, pole-size logs. No fire scars or burnt shells. No large or very large trees in stand. Dominant size class in 10-12” dbh.

Stand no.: 303-04-039 Plot no.: 067

Two-layered tree canopy--upper canopy of medium Douglas-fir and a 15-20’ canopy of saplings. Most of the sapling cover is in the lower layer. Burnt shells present. Fire model G-10.

Stand no.: 303-04-035 Plot no.: 068

Sapling and pole alder have crowns in same (or similar) layer. Schist rock and cobble on surface. Low layer of dense, continuous forbs. *Acer glabrum* and *Thuja plicata* saplings are the only plants present in the middle layer. A couple of well-rotted, ca. 15 in diameter logs, rest is <4 in, mostly from a dead maple. Two photos from north edge of plot.

Stand no.: 302-01-024 Plot no.: 069

On a broad ridge, stair-stepped by slumping. Stand has an old-growth character; large, burnt cedar shells common, no saplings in plot, one, >21-in downed log. Two photos from downslope plot edge.

Stand no.: 302-01-023 Plot no.: 070

Douglas-fir–grand fir with very large, burnt cedar shells. Poles are on the large side. Photo from south edge of plot.

Table 6 cont.

Stand no.: 302-01-021 Plot no.: 071

Very large charred shells; medium, downed logs in vicinity, but sparse; in a sort of bowl.

Stand no.: 302-01-020 Plot no.: 072

Small bench in undulating, dissected landform. Variable stand with patches of old growth. Steep slopes between here and road with medium Douglas-fir cover; benchlands with mixed conifers.

Stand no.: 302-01-017 Plot no.: 073

An upper slope just below shoulder ridge. There are no cedars on this slope, but on either side on slopes to streams. Two photos: first with ribbon on right, second from further out.

Stand no.: 302-01-070 Plot no.: 074

Medium Douglas-fir with a subcanopy of *Betula papyrifera*. Rather open upper canopy.

Stand no.: 302-02-017 Plot no.: 075

Douglas-fir root-rot pocket; many trees broken at mid-height. Schist rock lying on surface. Conditions extend upslope for a distance, and downslope all the way to Marquette Ck. Cedar only in draws. Three photos, two from slightly upslope of plot, one of upper canopy. Typical of much of stand 17.

Stand no.: 302-02-033 Plot no.: 076

Healthy, even-aged stand of Douglas-fir. Uniform upper canopy, with scattered gaps. Well-developed middle layer of Phymal-Holdis in places.

Stand no.: 302-01-003 Plot no.: 077

Canopy cover uniform, but with little crown overlap. Openings with *Acer glabrum*, ca. 20 ft tall. Poles are ca. 5" dbh, 20' tall. Photo 1 with top portion of plot in upper right, #2 shows all of plot.

Stand no.: 302-01-027 Plot no.: 078

Tall shrub/bunchgrass—no notes.

Stand no.: 302-01-025 Plot no.: 079

Old-growth cedar; downed wood highly variable in stand. Understory mostly depauperate. Habitat type may be due to proximity to drainage bottom. Large and very large trees are fire-scarred.

Stand no.: 302-01-025 Plot no.: 080

Classic old-growth cedar adjoining stream. Old, broken Douglas-fir stumps. Two photos from lower edge to 1) top and 2) bottom, showing large deadfall.

Table 6 cont.

Stand no.: 313-07-45 Plot no.: 081

Mature to old-growth cedar stand with scattered large grand fir, pole grand fir, and a nearly continuous layer of grand fir saplings. Many dead grand fir and cedar seedlings; abundant cedar seedlings; fire scars on large cedar. Sapling layer is 0.2 to 0.3 the height of the upper canopy; saplings average 12' tall. Photos 1 and 2: west edge, flag at right; #3: downslope edge, flag in upper left.

Stand no.: 313-07-046 Plot no.: 082

Young, pole/medium stand with some larger fire survivors; large, fire-scarred cedar and cedar shells. Very high amounts of downed wood, mostly undecomposed and stacked up; high fuels. Depauperate understory. Saplings are mostly cedar rather than grand fir as in plot 080. Three photos.

Stand no.: 313-07-048 Plot no. : 083

Mature Thupli-Abigra with open understory. Benchland. Downed wood is in medium to large size classes; most is moss-covered, mostly decomposed. Saplings and poles with crowns part of the uppermost canopy layer; ca. 3% of grand fir sapling cover is in the middle layer. Two photos: from downslope of plot center, and north, at edge of plot. #1 of bottom of plot with Bob, #2 of top portion of plot.

Stand no.: 302-01-030 Plot no. : 084

Healthy Douglas-fir stand; one grand fir seedling and no cedar. Asacau common. Negligible downed wood. One medium *Armillaria* tree (seepy spots around branches). Regeneration absent.

Stand no.: 303-03-038 Plot no. : 085

Multilayered stand with large openings in upper canopy, producing a crop of saplings and poles. Medium grand fir a minor component. Most downed wood is old and moss-covered. Large, burnt cedar shell present; pileated holes. Two photos—Michael is at plot center.

Stand no.: 303-03-050 Plot no. : 086

Weedy, grass-forb opening created by 1994 windthrow event in an *Alnus rubra*-*Pseudotsuga*/*Montia* community. Persistent seral stand due to unstable substrate. Upper, east extreme of blowdown area. Three photos: from lower end of plot: 1) flag at left is lower end of plot, 2) Michael standing near plot center, upslope flag at top; 3) most of west side of plot.

Stand no.: 303-03-031 Plot no. : 087

Grand fir stand with lots of Douglas-fir. Old cedar snags are small. Uniform stand with open, uniform herbaceous understory and few openings. No live cedar observed.

Table 6 cont.

Stand no.: 303-03-006 Plot no. : 088

Douglas-fir on steep slope with patches of Thupli saplings forming a sub-canopy along with Acegla. Poles are part of the upper canopy. Low understory of forbs and high diversity of low shrubs. Low amount of small, downed wood. Trees elbowed at base.

Stand no.: 303-03-035 Plot no. : 089

Slope down to stream (w/water) in extremely dissected, undulating terrain. Very patchy stand. Community is only about 1 ac in size. Stand polygon is very patchy with numerous community types. Includes a stream overflow channel, which is dominated by Athfil. Upper canopy of red alder at 130' and minor subcanopy of Acegla at ca. 50'. Some old-growth cedar from streamside hangs over plot.

Stand no.: 303-03-037 Plot no. : 090

Mature Thupli-Abigra with depauperate understory; patchy; elsewhere stand is more open with a low, forb understory; shrubs and ferns minor throughout. Two photos from plot edge toward center--very dark.

Stand no.: 303-03-037 Plot no. : 091

Mature Thupli-Abigra; one large and one medium cedar snag. Possibly on the border between stands 35 and 37. Three photos: #s 1 and 2 from plot edge, #3 from ca. 25' out in same direction.

Stand no.: 303-03-039 Plot no. : 092

Sapling/pole dominated stand on "nose" slope adjoining a stream on the north side. Numerous small (ca. 8") downed logs and one 23" downed larch. Large, burnt cedar shell, several dead alder > 9" dbh. Several very large cedar and larch fire survivors forming a very open upper (120-200') canopy with a dense layer of pole-size cedar forming a 30-50' subcanopy. Bimodal size-class distribution.

Stand no.: 303-03-040 Plot no. : 093

Very similar to plot 092 except that the upper layer is mature Douglas-fir rather than old-growth cedar. Abundant cedar saplings, along with poles, form a nearly closed sub-canopy; depauperate understory.

Stand no.: 303-03-011 Plot no. : 094

Medium, burnt cedar shells.

Stand no.: 303-03-030 Plot no. : 095

Large cedar outside plot is fire scarred; burnt cedar shell present.

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IDAHO DEPARTMENT OF FISH AND GAME

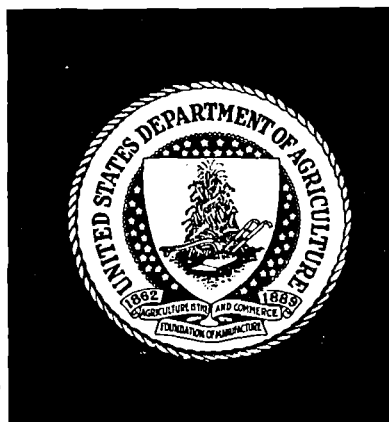
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